

CHAPTER 19 - Value Analysis

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CHAPTER 19 - Value Analysis

SECTION 1 - General

CALTRANS Policy

It is Caltrans' policy to apply Value Analysis (VA) in all functional areas including project development, construction, traffic, operations, and maintenance. VA should be applied during the development of projects regardless of whether the work is being accomplished by Caltrans employees, local agencies, consultants, or others.

Promoting Employee Support

To enhance the districts' VA program and generate employee participation in future VA studies, it is recommended that each district develop criteria and procedures for providing special recognition of individuals for exceptional VA accomplishments.

Definitions

The terms "Value Analysis" and "Value Engineering" (VE) can be used interchangeably in Caltrans and in the Value Engineering industry; however, Caltrans has adopted the term "Value Analysis".

Past use of the term "Value Engineering" has resulted in an impression that VE is an engineering discipline only and that a team of engineers is required to conduct the studies. In fact the VE teams typically include many non-engineers. Study subjects are not limited to only engineering projects. The VA process now includes planning, transportation development projects, analysis of processes, and quality improvements. Consequently, Caltrans now uses the term "Value Analysis": the process used to improve the quality and reduce the cost of transportation projects and other Caltrans programs.

Benefits of VA

VA is part of Caltrans' standard procedures for developing projects on the State transportation system. VA can provide the following benefits:

- Improve project quality
- Build consensus with transportation partners
- Develop solutions to difficult transportation issues
- Reduce project development time
- Reduce initial costs of projects
- Reduce life-cycle cost of projects

VA Techniques

VA is defined as a function-oriented, structured, team approach to solving problems and reducing life-cycle costs by applying techniques that adhere to a formal job plan. By use of these techniques, the VA team identifies the function of a product or service — establishes a worth for that function — generates alternatives through the use of creative thinking — and provides the required functions at the lowest overall costs.

For additional reading, see the following list of references.

Value Analysis Reference List

Value Engineering for Highways, VE Textbook, Revised December 1992 Federal Highway Administration, Washington, D.C., (NHI Course 13405), Publication No. FHWA-HI-88-051.

Value Engineering for Highways, VE Study Workbook, Federal Highway Administration, Washington, D.C., Revised December 1992, (NHI Course 13405), Publication No. FHWA-HI-88-047.

Guideline for Value Engineering, 1987, American Association of State Highway and Transportation Officials.

Value Analysis Field Guide, 1992, U.S. Department of Agriculture, Forest Service, Pacific Southwest Region.

Value Engineering Officer's Operational Guide, Jan. 1987, US Army Corps of Engineers, Office of Chief Engineer.

A Manual on User Benefit Analysis of Highway and Bus Transit Improvements, 1977, American Association of State Highway and Transportation Officials.

Group Power: A Manager's Guide to Using Meetings, 1986, William R. Daniels, University Associates, Inc., 8517 Production Avenue, San Diego, California 92121.

How To Make Meetings Work, The New Interaction Method, 1976, Michael Doyle & David Straus; Jove Books, Berkley Publishing Group.

Guidelines For Value Engineering (VE), February 1979, Task Force # 19, Subcommittee on New Highway Materials, AASHTO-AGC-ARBTA Joint Cooperative Committee, Reprinted by US. Department of Transportation / Federal Highway Administration.

SECTION 2 - Value Analysis Programs and Applications

ARTICLE 1 - Statewide Annual VA Program

Scope

The Design and Local Programs Program (DLPP) VA Branch must submit an annual State-wide VA Program to the FHWA by November 1st of each year. The state-wide program is a compiled list of the District Annual VA Programs plus any other VA studies of state-wide significance (see Article 3, "Other Applications").

ARTICLE 2 - District Annual VA Program

Applicability

The District Annual VA Program should consider any State transportation projects developed by Caltrans, local agencies, consultants, or private developers that are estimated to cost over one million dollars. The District Annual VA Program must be submitted to the DLPP VA Branch by July 1st each year. By notifying DLPP, projects may also be added to the Program during the Fiscal Year.

Criteria for VA Studies

The following project characteristics may indicate a need for a VA study:

- Project in the project initiation phase
- Cost overruns
- Only one alternative identified
- High maintenance cost
- Controversial projects
- Projects with difficult construction
- Operational problems
- Difficult traffic handling
- Safety concerns
- Environmental difficulties
- Right of way concerns
- Major structures
- Maintenance
- Complex geometrics
- Shelf projects

- Scope changes
- Schedule changes

ARTICLE 3 - Other Applications

Not Just Highway Projects

Any functional unit may initiate the VA process. These studies usually involve an item or process with State-wide or district-wide implications. Studies originating from functional units usually do not involve specific highway projects.

Initiation Process

Contact the District VA Coordinator to incorporate these types of studies into the District Annual VA Program. DLPP's VA Branch monitors the studies and assists in incorporating recommendations into appropriate State-wide standards, procedures, and processes.

District Value Analysis Coordinators initiating studies of items, standards, or processes should consult with DLPP VA Branch regarding the team selection process.

SECTION 3 - Roles and Responsibilities

Overall Caltrans Supervision

The Value Analysis Branch is located within DLPP. Its function is to develop and maintain VA policies and procedures, develop and monitor the Annual State-wide VA program (see Chapter 19, Section 2, of this manual), provide support and training, and apply VA to procedures, standards, and processes having State-wide significance. It is also responsible for monitoring the team meetings to assure adherence to the VA job plan.

District Directors

The District Directors are responsible for submitting the District Annual VA Program to the DLPP VA Branch by July 1st of each fiscal year. They also maintain a pool of VA-trained district employees representing all functional areas.

Project Managers

The Project Managers are responsible for identifying which of their projects will be Value Analyzed during the following fiscal year, and for submitting a list of these projects to the District VA Coordinator. Project Managers must also arrange for appropriate resources through the functional managers, consultants, and design centers, and must include Value Analysis in the project schedules.

District VA Coordinators

Each district has an assigned District VA Coordinator. The coordinator's function is to assure that VA policies and procedures are applied properly. The coordinator also monitors and reports on the district's VA studies to district management and to DLPP. A list of duties follows:

- Initiate the development of the District Annual VA Program.
- Send the District Annual VA Program to the District Director for approval. Send the approved program to the DLPP VA Branch.
- Send the approved VA program to the appropriate district unit responsible for modifying the "Status of Projects." The "Status of Projects" should be modified to indicate the target date for completing the VA study.
- The District VA Coordinator must notify the DLPP VA Branch and the FHWA regarding team membership, study start date – time – location and target date for completion.
- Monitor team meetings to assure adherence to the VA job plan.
- Send one copy of the completed VA Study Report and the Caltrans VA Study Workbook to the DLPP VA Branch.

- Submit quarterly progress reports to the DLPP VA Branch.

Headquarters Support Units

Division of Structures

The District VA Coordinator should provide the Structures VA Coordinator a minimum of four weeks notice prior to the start date of a VA study. The Division of Structures may be able to provide resource personnel for smaller VA studies and VA team members for larger VA Studies.

Office of Materials Engineering and Testing Services, of the Engineering Service Center

This office (METS) may be able to provide resource personnel for smaller VA studies and team members on larger projects. The District VA Coordinator should provide the VA Coordinator for METS a minimum of four weeks notice prior to the start date of the VA study.

Consultants

When a project is to be developed by a consultant, the Project Manager, the District VA Coordinator, and the consultant should work together to establish the VA study schedule, select the team leader, and select the team members. VA team membership should be similar to that discussed above in this section — plus the addition of consultant personnel.

Responsibilities

Consultant – The consultant is required to follow the procedures outlined in this chapter.

District VA Coordinator – The District VA Coordinator is responsible for assuring that the consultants adhere to the VA job plan.

Caltrans Project Manager – The Caltrans Project Manager and/or Contract Manager is responsible for including Value Analysis in the project development process. When the project is to be developed by a consultant, the Project Manager is responsible for the following:

- Including VA in the Request For Proposal (RFP)
- Providing sufficient number of hours and funds in the contract for VA work
- Scheduling the VA study: this includes identifying a date for presentation or completion of the study
- Being actively involved in the progress of the VA study
- Assuring Caltrans has adequate representation on the VA Team

SECTION 4 - Job Plan and Activities

ARTICLE 1 - VA Job Plan

Purpose

Value Analysis (VA) follows a specific job plan designed to identify functions. The job plan utilizes the creativity of a team to find more cost-effective ways to achieve these functions. The result is the development of new ways of achieving functions that result in a better end product and/or in lower initial or life-cycle costs.

Standards

Caltrans follows the VA Job Plan recognized by the American Association of State Highway and Transportation Officials (AASHTO) and the Society of American Value Engineers (SAVE).

Phases

There are eight phases to the VA Job Plan, each of which includes several tasks. The VA Team is responsible for performing all the Study Activities (phases 2 through 6).

VA JOB PLAN

PHASES	ACTIVITY TYPES
1. Project Selection • Team Selection	Pre-Study Activities
2. Investigation • Information / Analysis 3. Speculation 4. Evaluation 5. Development 6. Presentation	Study Activities
7. Implementation 8. Audit	Post-Study Activities

VA studies must be completed in accordance with this Job Plan and recorded in the Caltrans VA Study Workbook. The purpose of the workbook is to document tasks and information developed during the study.

The following articles in this section discuss the VA Job Plan activities: (1) Pre-Study Activities, (2) VA Study Activities, and (3) Post-Study Activities.

ARTICLE 2 - Pre-Study Activities (VA Team Selection)

Trained & Qualified Team Members

The experience and knowledge of the team members must be matched with the complexity and the political sensitivity of the project being studied. The team members must have sufficient knowledge and experience to assure the success of the study.

The VA team is usually a subgroup of the Project Development Team (PDT). Representatives from outside agencies are often included on the VA team as well. If the project has structures, the Division of Structures VA Coordinator should be given early notification so arrangements for structures involvement can be made.

The VA Team Leader should have completed the team leader training course offered by DLPP, and should have served as a team member of a prior VA team. Individuals who are Certified Value Specialists qualify as team leaders.

Team members should have completed the 40-hour VA workshop. Team members with no formal VA training may be allowed on an exception-only basis. Untrained members should not exceed one-third of the total team membership.

Non-Caltrans Members

Representatives from involved agencies should be considered for the VA team. These agencies may include: city or county, Metropolitan Planning Organization, US Forest Service, Bureau of Land Management, Department of Fish and Game, Regional Water Quality Control Board, or a representative of a local citizens' advocate group.

VA Team Selection

Team Leader Selection

The Project Manager and the District VA Coordinator should select the team leader.

Team Member Selection

After the team leader has been selected and has reviewed the project documents, team members should be selected by the team leader, Project Manager, and the District VA Coordinator. It is important that the Project Manager knows the qualifications of the team members, since the Project Manager will be asked to adopt the recommendations of the team.

It is recommended that team members be assigned or appointed to the study by a memorandum signed by the appropriate District Division Chief or the Project Manager. This establishes the authority for the team members to participate on the study.

Team Size

VA teams typically consist of five to eight members, including the team leader.

Resource People

To assess the project's technical features, as well as other important factors that may govern the scope of the project, the team leader (with input from team members) is responsible for inviting resource people to the VA meetings. Resource people should be specialists in their field of expertise or very knowledgeable about the technical, economic, political, or environmental feasibility of the alternatives. They should be invited during the Investigation Phase or at any other time that their expertise may be beneficial to the team in evaluating or developing alternatives. Resource people may be from local agencies, State and federal government (including FHWA Transportation Engineers), and from relevant Caltrans units, including DLPP Specialists; PD Coordinators; DLPP Geometric Reviewers; Environmental Coordinators; Environmental Planners; Transportation Planners; specialists from New Technology, Materials & Research; and others.

ARTICLE 3 - VA Study Activities

Study Duration

Typically, four to ten days (30 to 80 hours) of meeting time are required to conduct a VA study for a project. The total study period should not exceed 8 weeks. The time consuming portions of a VA study are the Investigation and Development phases. Some of the work in these two phases can be done outside of the formal meeting setting.

At the time the team is appointed, the Project Manager requesting the study should indicate when the study will begin and end, as well as the approximate number of hours (30 to 80) to be spent on the study. It is then the responsibility of the Team Leader to meet this schedule.

VA "Study" Phases

The remaining headings in this article describe the five phases associated with the VA Study Activities. The team is responsible for following the VA Job Plan and applying the appropriate VA techniques during each of these phases:

- Investigation Phase
- Speculation Phase
- Evaluation Phase
- Development Phase
- Presentation Phase

Investigation Phase

The objective of the Investigation Phase is to acquire knowledge of the project to be studied and to identify the major functions, cost, and worth.

The team leader must ensure that all the information related to the project has been gathered. The team leader should review all the information before meeting with the team. Copies of the project materials should be sent to the team before the first team meeting.

Some of the main questions that the team should ask are: —What is the proposed project? —What is the problem? —What problem does the project solve? —What is the cost? —Are there unresolved issues? —What must the project accomplish? —What is the function? —What is the value of the function? —What are the isolated areas for study? —What are the high cost items? —What are the constraints? —What commitments have been made to local agencies? —What are the design objectives?

Some of the techniques that can be used are Pareto's (80/20) Law, the Function Analysis Systems Technique Diagram (F.A.S.T.), and Function-Cost-Worth Analysis (Value Opportunity Index).

Speculation Phase

The objective of the Speculation Phase is to identify new ways of providing the basic function(s). To promote this objective, the team leader must promote creativity and an environment where new ideas can be developed.

In addition to "brainstorming" (the exchange of ideas in a non-judgmental environment), other techniques are available. This includes use of the Gordon technique (where only the team leader knows the exact nature of the problem under consideration) as well as the check-list technique (system of getting ideas/clues by checking items on a prepared list).

Evaluation Phase

The objective of the Evaluation Phase is to review and analyze the ideas presented in the Speculation Phase in order to select the best ideas for further development: the team must decide which idea(s) to carry forward to development.

At the end of the Evaluation Phase, the team leader should arrange an interim meeting with the Project Manager and other appropriate parties. The purpose of the meeting is to inform interested parties about the direction the VA team intends to proceed. The VA team should explain the basic function(s) of the project and the key issues that led to the VA team's proposed recommendation(s) or design variations. The VA team should also explain what is involved in the next phase (Development) and request that the meeting members provide any input that would assist in that phase.

Some of the key techniques that can be used in the Evaluation Phase include an evaluation matrix, a feasibility evaluation, a suitability evaluation, a ranking analysis, and the probabilities technique.

Development Phase

The objective of the Development Phase is to validate the feasibility of the ideas brought forward from the Evaluation Phase. This requires the analysis of impacts

on cost, schedule, environment, right of way, etc. If a design exception is required, the alternatives must be discussed with the PD Coordinator or Geometric Reviewer.

The team leader should assign tasks to the team members. Team members should remember that the intent is to obtain and present adequate backup data regarding VA recommendations and costs for presentation to the Project Manager.

During the Development Phase, the team may consult specialists and suppliers. Specialists may include either Caltrans personnel or consultants. Cost comparisons (savings) of the VA recommendations must use the same dollar base (year) as the estimate for the alternatives developed at the time the VA study began. Life-cycle costs should be analyzed, if applicable, during this phase.

Presentation Phase

The recommended alternatives from the VA Study are presented to the decision makers with all necessary back-up information so that decisions can be made at the presentation. Presenters should be factual, be brief, give credit, and provide an implementation plan. The presentation may be videotaped.

The team leader is responsible for arranging the presentation. Planning for the presentation should begin no later than the conclusion of the Evaluation Phase. Invitations should be sent to those people who have the authority to implement the recommendations. This may include the PDT, the Project Manager, and the District Division Chief(s) or District Director. The District VA Coordinator will notify the DLPP VA Branch and the FHWA of the date, time, and location of the team presentation.

Prior to the presentation, an executive summary should be prepared. It should include the project description or proposal, a list of the VA recommendations (with explanations), identified savings potential, and a proposed implementation plan for the recommendations.

A Value Analysis Report must be completed after the presentation. Three copies of the report and three copies of the executive summary must be forwarded to the DLPP VA Branch. An outline for such a report can be found in Appendix MM.

ARTICLE 4 - Post-Study Activities

Implementation Phase

Implementation of VA recommendations occurs only after the approval by the decision maker. If no decisions were made during the presentation, the team leader and the District VA Coordinator should meet with the Project Manager to discuss the VA team's recommendations. The Project Manager should address each of the recommendations, indicating the following in writing: "approval" — "conditional approval" — or "disapproval".

Audit Phase

The Audit Phase is necessary to review the effectiveness of the VA program.

District Quarterly Status Reports

To monitor the progress of the District's VA program, a District Quarterly Status Report must be submitted to the DLPP Value Analysis Branch, due October 1st, January 1st, April 1st, and July 1st of each year. A report form is provided in Appendix MM. The report should include the following items:

- Results of VA Study – The recommendations of the team should be outlined, including estimated costs. The estimate includes construction and right of way costs for the VA alternative. Life-cycle cost comparisons and user cost comparisons should also be provided where applicable.
- Implementation – The District VA Coordinator and the Project Manager must document the implementation status and the costs or savings associated with each adopted recommendation. An explanation should be included if portions of the recommendations were not approved for implementation.
- Benefits Other Than Cost – Although documented savings aid the effort to quantify study benefits, other benefits are realized and should also be documented. These benefits may include:
 - Improved project quality
 - Consensus building with transportation partners
 - Developed solution to difficult transportation issue
 - Stalled project can proceed because of VA recommendation

VA File

The District VA Coordinator is responsible for assuring that a VA file is maintained for the district. The VA file is composed of the following items:

- District Quarterly Reports
- VA Study Reports and workbooks

Note: A copy of the VA Study Report should also be part of the Project History Files under section 615 of the Caltrans Uniform Filing System. See Chapter 7.

SECTION 5 - Scope, Timing and Application of the VA Process

Scope of a VA Study

The scope of a VA study should be guided by the phase in which the study is being conducted. For example, a study in the design phase should not consider recommendations that would require a new Project Report since this has already been completed. The scope of a VA study in the design phase should focus on the elements of the approved project.

Timing of the VA Studies

Value Analysis (VA) Studies are appropriate at any of the following stages in the project development process. Subsequent headings in this section discuss the application of the VA process at each of these phases.

- Project initiation phase
- Project Report (PR) phase
- Plans, Specifications, & Estimate (PS&E) phase
- When a Cost, Scope, or Schedule Change is necessary

Timing is a critical factor in any successful VA study. The potential for improving the quality or cost effectiveness of the project is best at the early stages of PSR development and decreases somewhat through the PR, PS&E and construction phases of project development. The VA study should be conducted at the appropriate time in the project development phase to enable implementation of the VA recommendations without disrupting the project schedule. For example, the VA study for a PSR should be completed early enough so that recommendations assist in the development of the PSR.

Project Initiation Phase

A VA study in the project initiation phase is used to assist in developing new alternatives that will be included in the PSR or other project initiation documents. Emphasis is on the development of new alternatives and alternative comparisons. The scope of the study during this phase is less restrictive. Since the project in this phase of project development is not programmed (scheduled and funded), the recommendations normally will not impact critical milestones like R/W certification, project approval, or PS&E.

The VA Study is conducted as early as possible after basic design elements and preliminary cost information have been developed. The study is completed early enough so that the results of the VA study can be used in the writing of the project initiation document.

PR Phase

The scope of a VA study in the PR phase must consider the impact of the recommendations on established schedules. At this phase, the project is funded and a commitment to delivery has been established. To meet these commitments the scope of the VA study should focus on elements and concepts that will allow the project to remain on track. VA recommendations that would impact the schedule should immediately be brought to the attention of the Project Manager. These recommendations should only be considered if the benefit of the recommendation outweighs the impact on the schedule or programmed funding.

The VA team should be selected shortly after the project has been initiated. A suggested time frame to begin the study would be after Milestone 20 (Initiate Environmental Studies). The study should be concluded before Milestone 40 (Initiate Draft Project Report and Draft Environmental Document). By conducting the study during this time frame, the results of the study can be included in the Project Report and Environmental Document.

PS&E Phase

At this phase, the project has received project approval and project delivery milestones have been set. VA recommendations that would impact delivery should be brought to the attention of the Project Manager immediately. The scope of a VA study at this phase should focus on the elements of the existing approved project. The study should focus on items in the project that could be improved or done more cost effectively.

The VA team should be selected shortly after Milestone 200 (Initiate PS&E). The study should be conducted early in design so that the results can be incorporated into the PS&E. A suggested time frame for conducting the study would be after Milestone 220 (Geometric Base Maps) and before Milestone 221 (Bridge Site Data to Office of Structure Design).

Change Proposal for Scope / Cost / Schedule

Project Managers are encouraged to initiate the VA process in order to avoid entering into the scope/cost/schedule process described in Chapter 6. The VA process may provide the Project Manager with ways to keep the project on track without requiring a change in cost or scope. The scope/cost/schedule process requires the Project Manager to indicate if a VA study was done, and if not — why not. If a scope/cost/schedule change request is still necessary after the VA study, the Project Manager may use the VA study to support the request.